

ABSTRACT

1 An expert system is included in a downhole processor designed to acquire and process
2 NMR data downhole in real time. The downhole processor controls the acquisition of the
3 NMR data based at least in part on instructions transmitted downhole from a surface
4 location and at least in part on evaluation of downhole conditions by the expert system.
5 The downhole conditions include drilling operation conditions (including motion
6 sensors) as well as lithology and fluid content of the formation obtained from other
7 MWD data. The wait time, number of echos, number of repetitions of an echo sequence,
8 interecho time, bandwidth and shape of the tipping and refocusing pulses may be
9 dynamically changed. Data processing is a combination of standard evaluation
10 techniques. Selected data and diagnostics are transmitted uphole. The expert system
11 may be implemented as a two stage neural net. The first stage does the formation
12 evaluation and the second stage controls the NMR pulse sequence.